

identified patent application as follows:

IN THE CLAIMS:

Please amend claims 1-6 and 10-13.

Please cancel claims 14-15, without prejudice.

Regarding the claim amendments, Applicants have attached to this Amendment a document entitled "Marked-Up Claim Amendments". A clean copy of the amended claims is also enclosed herewith.

REMARKS

Entry of this Amendment and favorable reconsideration of this application, as presently amended, are respectfully requested for the purpose of placing the application in condition for allowance, or alternatively, in better condition for appeal.

In this Amendment, claims 1-6 and 10-13 have been amended. No new matter or new issues are believed to be present in this Amendment. Claims 14-15 have been canceled. Thus, claims 1-6 and 10-13 are pending in this application.

In the Outstanding Office Action, claims 14 and 15 have been withdrawn from consideration as being directed to a non-elected invention. In this Amendment, Applicants have canceled claims 14 and 15 to expedite favorable action. However, Applicants reserve the right to file a divisional application to the subject matter of claims 14 and 15.

Claims 1 and 2 have been rejected under 35 U.S.C.103(a) as being unpatentable over Cundiff et al (U.S.Patent No. 5,567,499) in view of Lubin (Handbook of Composites). The Examiner indicated Cundiff et al. teaches the use of the uncured adhesive films as well

as the use of uncured prepreg layers upon the cells of the honeycomb material. The use of uncured prepreg layers is taken by the Examiner as meaning thermosetting sealing material.

Furthermore, Lubin is cited by the Examiner to show that the materials which cure during bonding are thermosetting materials.

Moreover the Office Action notes, the film and the prepreg material of Cundiff clearly prevented the resin used to impregnate the dry preform in the resin transfer molding operation from penetrating into the cells of the honeycomb and as such were clearly sealing materials.

Claims 3-6 and 10-13 were rejected under 35 U.S.C.103(a) as being unpatentable over the references as set forth above in Cundiff and Lubin further in view of Fellman et al. (U.S.Patent No. 4,968,545), Ahrens (U.S.Patent No. 4,323,623) and Browne (U.S.Patent No. 4,861,649), optionally further taken with Narita (U.S.Patent No. 5,431,995).

Applicants respectfully traverse these rejections and request reconsideration for claims 1-6 and 10-13 based on reasons discussed herein.

Applicants' invention is related to method of making a honeycomb sandwich composite panel by using an RTM (Resin Transfer Molding) process. See page 1, first paragraph of the application. In previously known methods of forming honeycomb sandwich panels, as disclosed in the specification page 1 lines 24 to page 2, line 7, for keeping an impregnated resin from flowing into a honeycomb core, use is made of resin/moisture barrier film. However, the use of the prepreg material requires high material cost and expensive facilities for the storage of materials and for a curing operation. In particular, such methods create a problem of cost reduction of composite materials.

To solve this problem, as a method of forming honeycomb sandwich composite panel without the prepreg material, Applicants' invention recited in claims 1 and 2 forms the panel by stacking a dry fabric on both sides of a honeycomb core and providing a thermosetting sealing material placed between the dry fabric and the honeycomb core. It is a feature of the invention that the thermosetting sealing material is a resin film including glass microspheres (microballoons). This technique enables controlling the viscosity of the resin film and having an adhesive property for joining the honeycomb core to the dry fabric with a sufficient sealing effect to prevent the resin from flowing into the honeycomb core during resin impregnation. See page 4, line 4, et seq. and page 7, line 5 et seq. Specific structures are shown in the specification in page 7, line 3-25 and Figures 3 to 6.

Accordingly, the feature of Applicants' invention is to use the resin film including glass microspheres to adjust viscosity of the resin film as the thermosetting sealing material instead of the use of a prepreg material of the prior art. By this process, cost reduction is achieved.

In contrast to Applicants' invention, Cundiff discloses the honeycomb sandwich composite panel made by using an RTM (Resin Transfer Molding) process with the honeycomb core, adhesive film and a conventional prepreg material and dry fabric.

Cundiff describes his process in column 3, line 37 et seq; namely, (a) placing a first layer of an uncured adhesive film on the top side of a central honeycomb core having empty cells, and placing a second layer of an uncured adhesive film on the bottom side of the central honeycomb core; (b) placing a first layer of an uncured prepreg material above the first layer of uncured adhesive film, and placing a second layer of an uncured prepreg

material above the second layer of uncured adhesive film; (c) placing a first layer of a dry fiber preform above the first layer of uncured prepreg material, and placing a second layer of a dry fiber preform below the second layer of uncured prepreg material; (d) placing the charge made by steps (a)-(c) inside a mold and closing the mold; (e) heating the mold to the cure temperature of the adhesive film and the prepreg material, and holding the mold at this temperature for sufficient time to cure the adhesive film and the prepreg material; (f) reducing the temperature of the mold to the injection temperature of a selected resin transfer molding (KTM) resin system, and injecting the selected resin transfer molding (KTM) resin system into the mold; (g) holding the temperature of the mold at the cure temperature for the resin transfer molding (RTM) resin system for sufficient time to cure the resin system; and (h) removing the product from the mold after curing is completed.

It is clear that Cundiff does not show stacking dry fabric on both sides of the honeycomb core with a non-prepeg adhesive thermosetting sealing material and then heating the sealing material and the dry fabric at the curing temperature to cause initial hardening, followed by impregnating the dry fabric with a thermosetting-resin and then hardening the impregnated resin by hot-pressing the assembly.

Furthermore, there is no teaching or suggestion in Cundiff about the use of thermosetting sealing material including glass microspheres as sealing material instead of the use of the prepreg material.

Regarding Lubin, as the Examiner indicated, the "Handbook of Composites" discloses that a material which cures during bonding is a thermosetting material. Accordingly, Lubin only discloses that a curable material is in fact thermosetting. There is

no teaching or suggestion, however, about the use of the thermosetting sealing material including glass microspheres as sealing material, or the steps recited the claims herein.

For this reasons, Applicants believe that claim 1 is patentable over the references and respectfully request the reconsideration of this application.

The Examiner indicated based on Fellman et al., Ahrens et al., Browne, and Narita, that the use of syntactic foam which included resin and glass microspheres instead of the resin film and/or prepreg material would have been obvious.

However, Applicants respectfully submit the references only disclose the laminate structure of a prepreg and the syntactic foam, at the point of the use of prepreg material. It is clear that the secondary references do not suggest the advantages that are obtainable from Applicants' invention.

Moreover, the references fail to disclose the function of the thermosetting material which keeps the impregnated resin from flowing into a honeycomb core. Applicants' featured sealing material accomplishes the unique effect of controlling viscosity. Accordingly, even if the references are combined, the feature of Applicants' invention is not taught or suggested. Therefore, Applicants believe that the references do not render the invention *prima facie* obvious under 35 U.S.C. 103(a). Applicants respectfully request the Examiner to reconsider Applicants' invention recited in claims 1 and 2.

Regarding claims 3 and 10, these claims are dependent claims which depend from claim 1 or 2 (claim 3 depends from claim 1, claim 10 depends from claim 2), and define that the thermosetting sealing material comprises a laminated film formed by laminating a plurality of thermosetting resin films. This feature, in particular, namely, laminating a

plurality of thermosetting resin films is not disclosed in the references. Furthermore, for the same reason as given for claims 1 and 2, Applicants believe that claims 3 and 10 are patentable over the references.

Regarding claims 6 and 13, these claims are related to the method of forming a honeycomb sandwich composite panel with laminating a dry fabric on both side of the honeycomb core with a sealing material, in particular, the sealing material is laminated by a plurality of thermosetting resin adhesive films so as to prevent the impregnated resin from flowing into the dry fabric without using the prepreg material.

In contrast to Applicants' invention, Cundiff discloses the honeycomb sandwich composite panel by using an RTM (Resin Transfer Molding) process with the honeycomb core, adhesive film and prepreg material and dry fabric.

Accordingly, Cundiff uses a prepreg material, which is different from Applicants' invention.

Furthermore, the other references do not teach or suggest using thermosetting sealing material instead of using the prepreg material. For this reason, Applicants believe that claim 6 is patentable over the references.

Regarding claims 4-5, and 11-12, these are dependent claims which depend from claim 6 or 10 (claims 4-5 depend from claim 6, claims 11-12 depend from claim 13). These claims define the specific lamination of the thermosetting sealing material. For the same reason as claim 6 and 10, Applicants believe that claim 4-5 and 11-12 are patentable over the references.

In view of above, Applicants request that the rejection be withdrawn and the

claims be allowed at the Examiner's earliest convenience.

Respectfully submitted,

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Marked-Up Claim Amendments

1. (second amendment) A method of forming a honeycomb sandwich composite panel comprising [the steps of]:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

heating said sealing material and said dry fabric at the curing temperature of said sealing material to cause initial hardening of said sealing material and to dry fabric and to seal;

impregnating said dry fabric with a thermosetting resin; and

hardening the resin impregnated into said dry fabric by hot-pressing an entire assembly thus prepared under specific conditions,

said sealing material being a resin film including glass microspheres to adjust viscosity of said resin film having in addition to said adhesive property a sufficient sealing effect to prevent the resin from flowing into the honeycomb core during said impregnating step.

2. (second amendment) A method of forming a honeycomb sandwich composite panel comprising [the steps of]:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

hardening said sealing material by heating said sealing material and said dry fabric to the curing temperature of said sealing material and maintaining this temperature for a specified period of time;

impregnating said dry fabric with a thermosetting resin while varying the temperature of said sealing material and said dry fabric to a resin impregnating temperature and maintaining this temperature for a specified period of time; and

hardening the resin impregnated into said dry fabric by heating said sealing material and said dry fabric to the curing temperature of said thermosetting resin and hot-pressing them for



a specified period of time,

said sealing material being a resin film including glass microspheres to adjust viscosity of said resin film having in addition to said adhesive property a sufficient sealing effect to prevent said thermosetting resin from flowing into said honeycomb during said impregnating step.

3. (second amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 1, wherein said sealing material is a laminated film formed by laminating a plurality of thermosetting resin films [in which glass microballoons are mixed to adjust viscosity of said thermosetting resin films].

4. (second amendment) The method of forming the honeycomb sandwich composite panel as defined in claim [1] 6, wherein

said [sealing material] plurality of thermosetting resin films [is a laminated film formed of] includes at least two thermosetting resin adhesive films and,

a carrier material is placed between said thermosetting resin adhesive films to be used as an adhesive film of said thermosetting resin adhesive films.

5. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim [1] 6, wherein

said [sealing material] plurality of thermosetting resin films [is a laminated film formed of] includes at least two thermosetting resin adhesive films and,

a thermosetting resin film is placed between the thermosetting resin adhesive films, with glass microballoons mixed in said thermosetting resin film.

6. (first amendment) [The method of forming the honeycomb sandwich composite panel as defined in claim 1, wherein] A method of forming a honeycomb sandwich composite panel except for the use of a prepreg material comprising the steps of:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

heating said sealing material and said dry fabric at the curing temperature of said sealing material to cause initial hardening of said sealing material and to dry fabric and to seal;

impregnating said dry fabric with a thermosetting resin;

hardening the resin impregnated into said dry fabric by hot-pressing an entire assembly thus prepared under specific conditions: and

said sealing material [is] being a laminated film formed by laminating a plurality of thermosetting resin adhesive films.

10. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 2, wherein said sealing material is a laminated film formed by laminating a plurality of thermosetting resin films [in which glass microballoons are mixed to adjust viscosity of said thermosetting resin films].

11. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim [2] 13, wherein

said [sealing material] plurality of thermosetting resin films [is a laminated film formed of] includes at least two thermosetting resin adhesive films and,

a carrier material is placed between said thermosetting resin adhesive films to be used as an adhesive film of said thermosetting resin adhesive films.

12. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim [2] 13, wherein

said [sealing material] plurality of thermosetting resin films [is a laminated film formed of] includes at least two thermosetting resin adhesive films and,

a thermosetting resin film is placed between the thermosetting resin adhesive films, with glass microballoons mixed in said thermosetting resin film.

13. (first amended ) [The method of forming the honeycomb sandwich composite panel as defined in claim 2, wherein] A method of forming a honeycomb sandwich composite panel without using the prepreg material comprising:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

hardening said sealing material by heating said sealing material and said dry fabric to the curing temperature of said sealing material and maintaining this temperature for a specified period of time;

impregnating said dry fabric with a thermosetting resin while varying the temperature of said sealing material and said dry fabric to a resin impregnating temperature and maintaining this temperature for a specified period of time; and

hardening the resin impregnated into said dry fabric by heating said sealing material and said dry fabric to the curing temperature of said thermosetting resin and hot-pressing them for a specified period of time,

said sealing material [is] being a laminated film formed by laminating a plurality of thermosetting resin adhesive films.

Clean Version of the Claims

1. (second amendment) A method of forming a honeycomb sandwich composite panel comprising:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

heating said sealing material and said dry fabric at the curing temperature of said sealing material to cause initial hardening of said sealing material and to dry fabric and to seal;

impregnating said dry fabric with a thermosetting resin; and

hardening the resin impregnated into said dry fabric by hot-pressing an entire assembly thus prepared under specific conditions,

said sealing material being a resin film including glass microspheres to adjust viscosity of said resin film having in addition to said adhesive property a sufficient sealing effect to prevent the resin from flowing into the honeycomb core during said impregnating step.

2. (second amendment) A method of forming a honeycomb sandwich composite panel comprising:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

hardening said sealing material by heating said sealing material and said dry fabric to the curing temperature of said sealing material and maintaining this temperature for a specified period of time;

impregnating said dry fabric with a thermosetting resin while varying the temperature of said sealing material and said dry fabric to a resin impregnating temperature and maintaining this temperature for a specified period of time; and

hardening the resin impregnated into said dry fabric by heating said sealing material and said dry fabric to the curing temperature of said thermosetting resin and hot-pressing them for a specified period of time,

said sealing material being a resin film including glass microspheres to adjust viscosity

of said resin film having in addition to said adhesive property a sufficient sealing effect to prevent said thermosetting resin from flowing into said honeycomb during said impregnating step.

3. (second amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 1, wherein said sealing material is a laminated film formed by laminating a plurality of thermosetting resin films.

4. (second amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 6, wherein

said plurality of thermosetting resin films includes at least two thermosetting resin adhesive films and,

a carrier material is placed between said thermosetting resin adhesive films to be used as an adhesive film of said thermosetting resin adhesive films.

5. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 6, wherein

said plurality of thermosetting resin films includes at least two thermosetting resin adhesive films and,

a thermosetting resin film is placed between the thermosetting resin adhesive films, with glass microballoons mixed in said thermosetting resin film.

6. (first amendment) A method of forming a honeycomb sandwich composite panel except for the use of a prepreg material comprising the steps of:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

heating said sealing material and said dry fabric at the curing temperature of said sealing material to cause initial hardening of said sealing material and to dry fabric and to seal;

impregnating said dry fabric with a thermosetting resin;

hardening the resin impregnated into said dry fabric by hot-pressing an entire assembly thus prepared under specific conditions: and

said sealing material being a laminated film formed by laminating a plurality of thermosetting resin adhesive films.

10. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 2, wherein said sealing material is a laminated film formed by laminating a plurality of thermosetting resin films.

11. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 13, wherein

said plurality of thermosetting resin films includes at least two thermosetting resin adhesive films and,

a carrier material is placed between said thermosetting resin adhesive films to be used as an adhesive film of said thermosetting resin adhesive films.

12. (first amendment) The method of forming the honeycomb sandwich composite panel as defined in claim 13, wherein

said plurality of thermosetting resin films includes at least two thermosetting resin adhesive films and,

a thermosetting resin film is placed between the thermosetting resin adhesive films, with glass microballoons mixed in said thermosetting resin film.

13. (first amended ) A method of forming a honeycomb sandwich composite panel without using the prepreg material comprising:

stacking a dry fabric on both sides of a honeycomb core with a thermosetting sealing material having an adhesive property placed in between;

hardening said sealing material by heating said sealing material and said dry fabric to the curing temperature of said sealing material and maintaining this temperature for a specified period of time;

impregnating said dry fabric with a thermosetting resin while varying the temperature of said sealing material and said dry fabric to a resin impregnating temperature and maintaining this temperature for a specified period of time; and



hardening the resin impregnated into said dry fabric by heating said sealing material and said dry fabric to the curing temperature of said thermosetting resin and hot-pressing them for a specified period of time,

said sealing material being a laminated film formed by laminating a plurality of thermosetting resin adhesive films.